

# PLEISTOCENE MOLLUSKS FROM THE TRES MARIAS ISLANDS, CEDROS ISLAND, AND SAN IGNACIO LAGOON, MEXICO

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This paper is the result of the study of collections of Pleistocene fossils from Maria Madre and Maria Magdalena Islands, of the Tres Marias group, and Cedros Island and San Ignacio Lagoon, Lower California. The greater part of the fauna listed was collected by Mr. Henry Hemphill, Mr. W. H. Ochsner, Dr. G. D. Hanna and Mr. E. K. Jordan. The notes on the sedimentary deposits and their fossil content, extends our knowledge of the distribution and character of the Pleistocene along the west coast of North America. The writer wishes to express his appreciation for assistance in the determination of certain of the species by Mr. A. M. Strong and Dr. G. D. Hanna. The photographs of the new species illustrated herein were made by Dr. Hanna. Papers by Mr. E. K. Jordan dealing with similar deposits at San Quintin,<sup>1</sup> Magdalena Bay and at San Ignacio Lagoon,<sup>2</sup> have already been published.

Along the west coast of Lower California, raised beaches and terraces are rather common. Wittich<sup>3</sup> has pointed out that he has recognized marine beach deposits in Lower California which occur over 1000 meters above sea level. These were reported to contain shells of mollusks of recent appearance, which were considered to be subfossil.

## MARIA MADRE ISLAND

Fossiliferous beds on Maria Madre Island were mentioned by Grayson<sup>4</sup> and Nelson<sup>5</sup> and beds definitely referred to the Pleistocene were mentioned by Hanna<sup>6</sup>, and E. K. Jordan and Hertlein<sup>7</sup>. The fauna listed in this paper from Maria Madre and Maria Magdalena Islands, was collected by Dr. G. D. Hanna and

<sup>1</sup> Jordan, E. K., Proc. Calif. Acad. Sci. ser. 4, vol. 15, no. 7, 1926, pp. 241-255.  
1 textfigure and 1 plate.

<sup>2</sup> Jordan, E. K., Bull. South. Calif. Acad. Sci. vol. 23, pt. 5, September-October (issued October 25), 1924, pp. 145-146.

<sup>3</sup> Wittich, E., Contribucion a la Geologica de la Region meridional de la Baja California, Bol. Soc. Geol. Mexicana, vol. 6, pt. 1, 1909, p. XIII and pp. 9-12.—Strandlinien an der Südküste von Niederkalifornien, Globus, Bd. 97, 1910, p. 379.—Über Meeresschwankungen an der Küste von Kalifornien, Zeitschr. Deutsch. Geol. Gesellsch. Monatsteir, 1912, pp. 505-512.—La emersion moderna de la costa oeste de la Baja California, Soc. cient. Antonio Alzate, (Mexico), Mem., vol. 35, nos. 3-4, 1920, pp. 121-144, 10 pls., 1 fig.—See also G. Eisen, Proc. Calif. Acad. Sci. ser. 2, vol. 5, 1895, p. 754.—Darton, N. H., Geologie reconnaissance in Baja California, Journ. Geol. vol. 29, no. 8, November-December, 1921, pp. 720-748, 22 figs.

—Hanna, G. D., Nat. Geogr. Mag. vol. 14, no. 1, 1923, p. 99.

<sup>4</sup> Proc. Boston Soc. Nat. Hist. vol. 14, 1871, pp. 261-303.

<sup>5</sup> North American Fauna, no. 14, U. S. Dept. Agric. (Natural History of the Tres Marias Islands), 1899, pp. 1-97.

<sup>6</sup> Pan-Amer. Geol. vol. 48, no. 1, 1927, pp. 20-21.—Proc. Calif. Acad. Sci. ser. 4, vol. 15, no. 1, 1926, p. 75.

<sup>7</sup> Proc. Calif. Acad. Sci. ser. 4, vol. 15, no. 4, 1926, p. 210.

E. K. Jordan, during the Expedition of the California Academy of Sciences to the Revillagigedo Islands in 1925.

The collection made at the Salt Works on the east side of the island, Loc. 1834 (C. A. S.), came from beds made up of shell fragments and may be considered to be a coquina. The beds are only a few meters in thickness and are exposed for some distance along the coast.

The species represented are similar to those of the Upper Pleistocene at Magdalena Bay.<sup>8</sup> In their recent habitat nearly all the species are found at the Tres Marias Islands,<sup>9</sup> but a few are found only in the Gulf of California and to the south. These beds on Maria Madre can be assigned to the Upper Pleistocene.

The shells from Loc. 1838 (C. A. S.), at the light house by the village, are from a raised beach and their recent appearance suggests that they are subfossil.

A few specimens were collected from Loc. 1839 (C. A. S.), from the north end of the island. These are apparently from a raised beach and can be assigned to the late Pleistocene.

Loc. 1834 (C. A. S.) Maria Madre Island, Mexico, at Salt works on east side of the island, about 215 meters inland. G. D. Hanna and E. K. Jordan collectors, 1925. Pleistocene.

Loc. 1838 (C. A. S.) Maria Madre Island, Mexico. At light house at the village. General pink Pleistocene. G. D. Hanna and E. K. Jordan, collectors, 1925. Raised Beach. Subfossil.

Loc. 1839 (C. A. S.) Maria Madre Island, Mexico. Pleistocene at North East end of Island. Raised Beach. G. D. Hanna and E. K. Jordan, collectors, 1925. Pleistocene.

#### LIST OF SPECIES FROM THE PLEISTOCENE OF MARIA MADRE ISLAND

*Antigona rigida* Dillwyn, Loc. 1839 (C. A. S.).  
*Apolymetis alta* Conrad, Loc. 1834 (C. A. S.).  
*Arca multicostata* Sowerby, Loc. 1834 (C. A. S.).  
*Cardium biangulatum* Sowerby, Loc. 1834 (C. A. S.).  
*Cardium consors* Broderip & Sowerby, Loc. 1834 (C. A. S.).  
*Cardium clavense* Sowerby, Loc. 1834 (C. A. S.).  
*Cardium sp.*, Loc. 1834 (C. A. S.).  
*Chione mariae* d'Orbigny, Loc. 1834 (C. A. S.).  
*Chione succincta* Valenciennes, Loc. 1834 (C. A. S.).  
*Chione undatella* Sowerby, Loc. 1834 (C. A. S.).  
*Codakia distinguendo* Tryon, Loc. 1834 (C. A. S.).  
*Divaricella eburnea* Reeve, Loc. 1834 (C. A. S.).

<sup>8</sup> In Mr. Jordan's paper in 1924 two faunal lists are given which refer to an Upper and a Lower Quaternary fauna from Magdalena Bay. Insufficient information regarding the collections upon which he based his conclusions regarding two horizons, raised an element of doubt regarding the exact localities. After a visit to Magdalena Bay in 1925, Mr. Jordan stated verbally to the writer that only one horizon is present at Magdalena Bay and that it may be referred to the Upper Pleistocene. A report by Mr. Jordan on the collections from this locality is now awaiting publication.

<sup>9</sup> See A. M. Strong and G. D. Hanna, Marine mollusca of the Tres Marias Islands, Mexico, Proc. Calif. Acad. Sci. ser. 4, vol. 19, no. 3, 1930, pp. 13-22.

*Glycymeris multicostata* Sowerby, Loc. 1834 (C. A. S.).  
*Macrocallista orcutti* Dall, Loc. 1834 (C. A. S.).  
*Macrocallista squalida* Sowerby, Loc. 1834 (C. A. S.).  
*Pecten circularis* Sowerby, Loc. 1834 (C. A. S.).  
*Pecten latiauratus* Conrad, Loc. 1834 (C. A. S.).  
*Pecten subnodosus* Sowerby, Loc. 1838 (C. A. S.).  
*Phacoides lamprus* Dall, Loc. 1834 (C. A. S.).  
*Pitar concinna* Sowerby, Loc. 1834 (C. A. S.).  
*Placunonomia cumingii* Broderip, Loc. 1834 (C. A. S.).  
*Pteria (Pinctada) mazatlanica* Hanley, Loc. 1834 (C. A. S.).  
*Venecricardia flammacea* Michelin, Loc. 1834 (C. A. S.).  
*Cadulus tolmici* Dall, Loc. 1834 (C. A. S.).  
*Dentalium fischeri* Stearns, Loc. 1834 (C. A. S.).  
*Dentalium quadrangulare* Hanley, Loc. 1834 (C. A. S.).  
*Acmaea rosacea* Carpenter, Loc. 1834 (C. A. S.).  
*Actecocina angustior* Baker & Hanna, Loc. 1834 (C. A. S.).  
*Anachis coronata* Sowerby, Loc. 1834 (C. A. S.).  
*Architectonica granulata* Lamarck, Loc. 1834 (C. A. S.).  
*Callistoma cf. tricolor* Gabb, Loc. 1834 (C. A. S.).  
*Clava geminata* Hinds, Loc. 1834 (C. A. S.).  
*Clavus (Cynatosyrinx) aeolia* Dall, Loc. 1834 (C. A. S.).  
*Conus lucidus* Mawe, Loc. 1834 (C. A. S.).  
*Conus tornatus* Broderip, Loc. 1834 (C. A. S.).  
*Crucibulum imbricatum* Sowerby, Loc. 1834 (C. A. S.).  
*Epitonium cf. brunneopictum* Dall, Loc. 1834 (C. A. S.).  
*Eunaticina heimi* E. K. Jordan, n. sp., Loc. 1834 (C. A. S.).  
*Fasciolaria princeps* Sowerby, Loc. 1834 (C. A. S.).  
*Hemitoma (Emarginula) sp.*, Loc. 1834 (C. A. S.).  
*Liotia cf. carinata* Carpenter, Loc. 1834 (C. A. S.).  
*Mcclauella cf. monicensis* Bartsch, Loc. 1834 (C. A. S.).  
*Modulus cerodes* A. Adams, Loc. 1834 (C. A. S.).  
*Nassarius versicolor* Adams, Loc. 1834 (C. A. S.).  
*Natica broderipiana* Recluz, Loc. 1834 (C. A. S.).  
*Oliva splendidula* Sowerby, Loc. 1834 (C. A. S.).  
*Oliva* sp., Loc. 1834 (C. A. S.).  
*Olivella gracilis* Sowerby, Loc. 1834 (C. A. S.).  
*Olivella cf. pedroana* Conrad, Loc. 1834 (C. A. S.).  
*Polinices uber* Valenciennes, Loc. 1834 (C. A. S.).  
*Pyrene cf. strombiformis* Lamarck, Loc. 1834 (C. A. S.).  
*Strombina pulcherrima* Sowerby, Loc. 1834 (C. A. S.).  
*Strombus granulatus* Gray, Loc. 1834 (C. A. S.).  
*Turbo fluctuosus* Wood, Loc. 1838 (C. A. S.).  
*Turbo saxosus* Wood, Loc. 1834 (C. A. S.).  
*Turbo squamiger* Reeve, Loc. 1834 (C. A. S.).  
*Vitrea indentata* Say, Loc. 1834 (C. A. S.).  
Worm tubes, Loc. 1834 (C. A. S.).  
*Balanus concavus pacificus* Pilsbry, Loc. 1834 (C. A. S.).  
Shark tooth, Loc. 1834 (C. A. S.).

## MARIA MAGDALENA ISLAND

Pleistocene sediment on Maria Magdalena Island was reported by G. D. Hanna<sup>10</sup> as forming a thin veneer over the older rocks near the shore line along the middle of the north side. The beds and enclosed fauna are similar to those from the Salt works on the east side of Maria Madre Island. An Upper Pleistocene age can be assigned to these beds.

Loc. 1836 (C. A. S.) Maria Magdalena Island, Tres Marias Group, Mexico. Along beach cliffs about the middle of the north shore of Maria Magdalena Island. G. D. Hanna and E. K. Jordan collectors, 1925. Pleistocene.

### LIST OF SPECIES FROM THE PLEISTOCENE OF MARIA MAGDALENA ISLAND

Sponge.

Coral.

Echinoid spine.

*Anomalocardia subimbricata* Sowerby.

*Arca multicostata* Sowerby.

*Arca mutabilis* Sowerby.

*Arca gradata* Broderip & Sowerby.

*Arca solida* Sowerby.

*Cardium biangulatum* Sowerby.

*Cardium consors* Sowerby.

*Cardium obovale* Sowerby.

*Cardium senticosum* Sowerby.

*Chama squamuligera* Pilsbry & Lowe.

*Chione succincta* Valenciennes.

*Codakia mexicana* Dall.

*Glans laticostata* Sowerby.<sup>11</sup>

*Glycymeris multicostata* Sowerby.

*Glycymeris tessellata* Sowerby.

*Macrocallista squalida* Sowerby.

*Nuculana impar* Pilsbry & Lowe.

*Nuculana taphria* Dall.

*Pecten circularis* Sowerby.

*Petricola robusta* Sowerby.

*Phacoides cancellaris* Philippi.

*Plicatula spondylopsis* Rochebrune.

*Spondylus crassisquama* Lamarck (young specimens).

<sup>10</sup> Proc. Calif. Acad. Sci. ser. 4, vol. 15, no. 1, 1926, pp. 72-73.—Pan-Amer. Geol. vol. 48, no. 1, 1927, p. 23.

<sup>11</sup> It may be mentioned here that the species commonly listed as *Cardita subquadrata* Carpenter (*Lazaria subquadrata* Carpenter, Rept. Brit. Assoc. Adv. Sci. for 1863 [Issued 1864], pp. 536, 627, 642. The type locality is Santa Barbara, California, according to I. S. Oldroyd, Stanford Univ. Publ. Univ. Ser. Geol. Sci. vol. 1, 1924, p. 111) was renamed *Cardita carpenteri* by Lamy (Jour. de Conchyl. vol. 66, no. 3, 1922, p. 264 "Californie.") due to an earlier use of the name by Conrad (*Cardita subquadrata* Conrad, Proc. Acad. Nat. Sci. Philadelphia, 1847, p. 298, Mississippi, Eocene). *Glans minuscula* Grant & Gale (Mem. San Diego Soc. Nat. Hist., vol. 1, 1931, p. 277, pl. 13, figs. 10a, 10b. "Upper Pleistocene terrace near Seacliff, Ventura Co.") thus becomes a synonym of *G. carpenteri* Lamy.

*Acmaea ?atrata* Carpenter (young specimen).  
*Actcocina ?angustior* Baker & Hanna.  
*Alectes squamigerus* Carpenter.  
*Alcancia herrerae* Baker, Hanna & Strong.  
*Anachis incerta* Stearns.  
*Anachis pygmaea* Sowerby.  
*Anachis ?vexillum* Reeve.  
*Cancellaria* sp.  
*Clava gemmata* Hinds.  
*Conus* (young) cf. *mahogani* Reeve.  
*Conus* cf. *tornatus* Broderip (young).  
*Crepidula aculcata* Gmelin.  
*Crepidula* cf. *lingulata* Gould.  
*Crepidula nummaria* Gould var. ? *fimbriata* Reeve.  
*Crepidula* cf. *onyx* Sowerby.  
*Crucibulum imbricatum* Sowerby.  
*Crucibulum spinosum* Sowerby.  
*Cypraca* cf. *arabicula* Lamarck.  
*Cytharella carissima* Pilsbry & Lowe.  
*Cytharella quadriseptata* Dall.  
*Diadora inaequalis* Sowerby.  
*Diadora murina* Dall.  
*Diadora panamensis* Sowerby.  
*Engina ferruginea* Reeve.  
*Fissurella virescens* Sowerby.  
*Fissurella* sp.  
*Harpa crenata* Swainson.  
*Hipponix antiquatus* Limaeus.  
*Hipponix barbatus* Sowerby.  
*Hipponix grayanus* Menke.  
*Hipponix tumens* Carpenter.  
*Liota ?rammata* Dall.  
*Marginella* cf. *M. californica* Tomlin.  
*Marginella phrygia* Sowerby.  
*Mitra* cf. *attenuata* Reeve.  
*Nassarius versicolor* C. B. Adams.  
*Natica* sp. (young) aff. *N. catenata* Philippi.  
*Nerita bernhardi* Recluz.  
*Odostomia gallegosi* Hertlein, new species.  
*Olivella* cf. *gracilis* Broderip & Sowerby.  
*Oliva testacea* Lamarck (young).  
*Oxystyla princeps* Broderip.  
*Phasianella* (Tricolia) *mazatlanica* Strong.  
*Philbertia acthra* Dall.  
*Rissoina stricta* Menke.  
*Rissoina torenscudi* Bartsch.  
*Scila assimillata* C. B. Adams.  
*Siphonaria maura* var. *acquilarata* Carpenter.

*Strombina ?pulcherrima* Sowerby.  
*Tegula globula* Carpenter.  
*Teinostoma cecinella* Dall.  
*Terebra* sp.  
*Triphora* cf. *stearnsi* Bartsch.  
*Turbo fluctuosum* Wood.  
*Turritella nodulosa* King.  
*Vermicularia eburnea* Reeve.

#### SAN IGNACIO LAGOON, LOWER CALIFORNIA

Mr. E. K. Jordan's<sup>12</sup> paper on Quaternary Molluscan faunas from Lower California, included a list of species and brief discussions of Pleistocene mollusks from San Ignacio Lagoon, Lower California. He considered this fauna to be of an Upper Pleistocene age and with this opinion the writer is in accord.

The present faunal list from San Ignacio Lagoon represents the species in the collection of the California Academy of Sciences, collected at that locality by Mr. Henry Hemphill, supplemented by the H. Hemphill collection at Leland Stanford Junior University and the one made by C. R. Swarts and T. J. Cullen (Loc. 38 L. S. J. U.), which was listed by E. K. Jordan. The species in the list followed by (S) are those in the collections of the Leland Stanford Junior University but not represented in the collections of the California Academy of Sciences. With much larger collections available for comparison, Mr. Jordan later indicated some corrections in the identifications of certain species which are listed in his paper in 1924. The corrections are indicated in the present list.

#### LIST OF SPECIES FROM THE PLEISTOCENE OF SAN IGNACIO LAGOON, LOWER CALIFORNIA

*Encope micropora* A. Agassiz.  
*Anomia peruviana* d'Orbigny.  
*Apolymetis excavatus* Sowerby.  
*Area tuberculosa* Sowerby.  
*Cardium clenense* Sowerby (as *C. substriatum* Conrad, by Jordan, 1924).  
*Cardium procerum* Sowerby (S).  
*Chione gividia* Broderip & Sowerby.  
*Chione succincta* Valenciennes.  
*Chione undatella* Sowerby.  
*Corbula luteola* Carpenter (S).  
*Diplodonta sericata* Reeve.  
*Donax californica* Conrad.  
*Glans affinis* Broderip.  
*Glycymeris giganteus* Reeve (S).  
*Labiosa undulata* Gould.

<sup>12</sup> Bull. South. Calif. Acad. Sci. vol. 23, pt. 5, Sept.-Oct. 1924. Issued Oct. 25, 1924, pp. 151-152.

*Macoma nasuta* Conrad (S.) (as *M. inquinata* Deshayes by Jordan, 1924).  
*Macoma yoldiformis* Carpenter (S).  
*Macrocallista squamida* Sowerby.  
*Mactra californica* Conrad (S).  
*Nuculana clavata* Sowerby.  
*Ostrea palmula* Carpenter.  
*Pecten circularis* Sowerby (S).  
*Phacoides approximatus* Dall.  
*Phacoides lingualis* Carpenter.  
*Phacoides nuttalli* Conrad.  
*Semele decisus* Conrad.  
*Tagelus californicus* Conrad.  
*Tellina buttoni* Dall (S) (as *T. modesta* Carpenter by Jordan, 1924).  
*Tellina merropsis* Dall.  
*Tellina reclusa* Dall.  
*Tellina rubescens* Hanley.  
*Dentalium inversum* Deshayes (S.) (as *D. pretiosum* Sowerby by Jordan, 1924).  
*Dentalium sectum* Deshayes (S).  
*Dentalium semipolitum* Broderip & Sowerby (S).  
*Aletes squamigerus* Carpenter.  
*Amphissa columbiana* Dall.  
*Anachis coronata* Sowerby.  
*Bulla punctulata* A. Adams.  
*Calliostoma eximium* Reeve.  
*Calliostoma palmeri* Dall.  
*Cancellaria buccinoides* Sowerby.  
*Cantharus elegans* Gray.  
*Cerithidea californica* Haldemann.  
*Cerithium stercus-muscarum* Valenciennes (also as *C. ocellatum* Bruguiere, by Jordan, 1924).  
*Crepidula adunca* Sowerby.  
*Crepidula excavata* Sowerby.  
*Crepidula onyx* Sowerby.  
*Crucibulum imbricatum* Sowerby.  
*Crucibulum cf. spinosum* Sowerby.  
*Cytharella* sp.  
*Diadora murina* Dall.  
*Eupleura muriciformis* Broderip.  
*Fusinus dupetithouarsi* Kiener (S).  
*Glyphostoma* aff. *G. adana* Dall.  
*Lucapinella callomarginata* Carpenter.  
*Macromesistius kelletii* A. Adams.  
*Melanella cf. oldroydi* Barsch.  
*Mitrella carinata* Hinds.  
*Modulus disculus* Philippi.  
*Murex crinaceoides* Valenciennes.

*Nassarius* cf. *corrifensis* Arnold.  
*Nassarius* *tegula* Reeve.  
*Neritina usurpatrix* Crosse & Fischer.  
*Oliva angulata* Lamarck.  
*Oliva spicata* Bolten.  
*Olivella dama* Mawe (S).  
*Olivella gracilis* Broderip & Sowerby (S) (as *O. inconspicua* C. B. Adams by Jordan, 1924).  
*Olivella bactica* var. *mexicana* T. S. Oldroyd.  
*Olivella pedroana* Conrad (S).  
*Petaloconchus complicatus* Dall.  
*Phyllonotus bicolor* Valenciennes (S).  
*Phyllonotus radix* Lamarck (S).  
*Polinices reclusianus* Deshayes.  
*Pseudomelatoma penicillata* Carpenter.  
*Purpura nuttalli* Conrad.  
*Pyramidella mexicana* Dall & Bartsch.  
*Pyrene strombiformis* Lamarck.  
*Solenostcira anomala* Reeve.  
*Strombina gibberula* Sowerby (as *Nitidella occellata* Gmelin, by Jordan, 1924).  
*Strombus gracilior* Sowerby (S).  
*Tegula aurcotincta* Forbes.  
*Terebra variegata* Gray.  
*Thais biserialis* Blainville.  
*Tritonalia poulsoni* Carpenter.  
*Turbo fluctuosus* Wood.  
*Turbanilla buttoni* Dall & Bartsch.  
*Turridula maculosa* Sowerby (as *T. burragei* Bartsch by Jordan, 1924).  
*Turritella marmorata* Kiener.  
*Turritella tigrina* Kiener<sup>13</sup> (S).

#### CEDROS ISLAND

The mollusks from Cedros Island here listed occur on raised beaches from 15 to 30 meters above sea level and appear to be of a late Pleistocene age. These shells were collected by Mr. W. H. Ochsner in 1905 during the expedition of the California Academy of Sciences to the Galapagos Islands, and by Dr. Hanna in 1922, during the expedition of the California Academy of Sciences to Guadalupe Island.

Loc. 801 (C. A. S.). South Bay of Cedros Island. W. H. Ochsner collector, 1905-1906.

Loc. 931 (C. A. S.). West side of Cedros Island. Raised Beach. G. D. Hanna collector, 1922.

Loc. 2323 (C. A. S.). Raised Beach at South Bay, Cedros Island. G. D. Hanna collector, 1922.

<sup>13</sup> The species listed as *T. goniostoma* Valenciennes by Jordan, 1924, from the Quaternary of Seaman Lagoon, can be referred to *T. tigrina* Kiener or *T. leucostoma* Valenciennes.

LIST OF SPECIES FROM THE PLEISTOCENE OF CEDROS  
ISLAND (RAISED BEACHES).

*Phacoides californicus* Conrad, Locs. 801; 931 (C. A. S.).  
*Tivela crassatelloides* Conrad, Loc. 801 (C. A. S.).  
*Acanthina lugubris* Sowerby, Loc. 2323 (C. A. S.).  
*Conus californicus* Hinds, Loc. 931 (C. A. S.).  
*Fissurella volcano* Reeve, Locs. 801; 931; 2323 (C. A. S.).  
*Haliotis cracherodii* Leach, Loc. 2323 (C. A. S.).  
*Hipponix antiquatus* Linnaeus, Loc. 931 (C. A. S.).  
*Lottia gigantea* Gray, Locs. 801; 2323 (C. A. S.).  
*Megathura crenulata* Sowerby, Locs. 931; 2323 (C. A. S.).  
*Norrisia norrisi* Sowerby, Loc. 801 (C. A. S.).  
*Polinices reclusianus* Deshayes.<sup>14</sup>  
*Tegula aureotincta* Forbes, Locs. 801; 931; 2323 (C. A. S.).  
*Tegula gallina* Forbes, Loc. 2323 (C. A. S.).  
*Thais biserialis* Blainville, Loc. 2323 (C. A. S.).  
*Trivia californica* Gray, Loc. 931 (C. A. S.).

NOTES AND DESCRIPTIONS OF SPECIES

*Odostomia gallegosi* Hertlein, new species.

Plate 21, figure 3

Shell small, pupiform, rather thick, surface smooth and polished; nuclear whorls almost completely immersed in the first of the following whorls; postnuclear whorls 7, the early ones rounded, rapidly enlarging, the last 3 flattened, somewhat cylindrical, narrowly tabulated at the summit, somewhat contracted at the sutures, without visible sculpture; periphery rounded, marked by a narrow sulcus; base short, rounded; aperture oval, the posterior angle acute, falling a little below the sulcus which is exposed in the sutures on the later whorls; columella short, curved, provided with a strong fold at its insertion, body of the shell with a thin callus. The type measures; length 4.5 mm., diameter, 1.8 mm.

Holotype No. 6059 (Calif. Acad. Sci. type coll.) from Loc. 1836 (C. A. S.) along the beach cliffs on about the middle of the north shore of Maria Magdalena Island, Tres Marias Group, Mexico. G. D. Hanna and E. K. Jordan Collectors. Pleistocene.

Mr. A. M. Strong has pointed out to the author that this species is quite distinct from any *Odostomia* described from western North America. The absence of all sculpture with the exception of the peripheral sulcus removes it from all the subgenera known from the west American fauna. In the key to the subgenera in the genus *Odostomia* by Dall & Bartsch<sup>15</sup> it would fall

<sup>14</sup> This species was reported fossil on Cedros Island by Stearns (Proc. U. S. Nat. Mus. vol. 17, 1894, p. 196 "fossil on Cerros Island", Albatross coll.).

<sup>15</sup> U. S. Nat. Mus. Bull. 68, 1919, p. 15. "Type, *Turbo nirosa* Montagu." (Montagu, Test. Britannica, vol. 2, 1803, p. 326. "Found in the sand on the south coast of Devon, very rare."—Forbes & Hanley, Hist. British Moll., vol. 3, 1853, p. 287, pl. 96, fig. 7.—Jeffreys, British Conch., vol. 4, 1867, p. 116.).

in the subgenus *Jordaniella*,<sup>16</sup> and furnishes the first record of this subgenus from western North America.

Eunaticina heimi E. K. Jordan, new species<sup>17</sup>

Plate 21, figure 4

Shell small, thin, naticoid, spire short with about 3 to 4 inflated whorls; surface sculpture by numerous fine spiral incised lines. These are crossed by fine lines of growth; umbilicate; aperture ovate; margins of inner and outer lip plain. Altitude 9.6 mm.; width of body whorl 7 mm.

Holotype No. 5557 (Calif. Acad. Sci. Type Coll.) from Loc. 754 (C. A. S.) Magdalena Bay, Lower California. G. D. Hanna and E. K. Jordan collectors; Pleistocene.

The slender form and ovate aperture easily distinguish this species from *Eunaticina oldroydii* Dall.<sup>18</sup> *Eunaticina heimi* is found living at Hood Island of the Galapagos Group. The species also occurs in the Pleistocene of Magdalena Bay, Lower California, and in the Pleistocene of Maria Madre Island, Mexico.

Macron kelletii A. Adams

*Pseudoliva kelletii* A. Adams, Proc. Zool. Soc. London, 1853, p. 185. "Hab.—?"—Sowerby, Thes. Conch. vol. 3, 1885, *Pseudoliva*, p. 75, pl. 116, fig. 12. "Hab.—?"—Carpenter, Rept. British Assoc. Adv. Sci. for 1863 [Issued 1864], p. 554. "[=Macron (Zemira) *Kelletii*, Mus. Cum. :=*Pusio trochlea*, Gray, MS. in Brit. Mus. Cerros Is., Ayres]."

*Macron kelletii* A. Adams, Tryon, Manual Conch. vol. 3, 1881, p. 214, pl. 82, fig. 477. "San Diego, Cal.; Gulf of California."

*Macron aethiops* (Reeve), var. *kelletii* (A. Adams), Grant & Gale, Mem. San Diego Soc. Nat. Hist. vol. 1, 1931, p. 650, pl. 28, fig. 8. Earlier records cited.

*Macron kelletii* is present in the Pleistocene at San Ignacio Lagoon, Lower California. It has been reported from the Pleistocene of southern California, and recent from San Diego, California, to the Gulf of California.

Due to uncertainty regarding the status of *M. kelletii* it is retained as a distinct species in the present paper.

<sup>16</sup> *Jordaniella* Chaster, n. gen., Proc. Roy. Irish Acad., ser. 3, vol. 5, no. 1, 1898, p. 20 [name], p. 21 [under *J. nivosa* Montagu] "The *Turbo nivosa* of Montagu and the *Odostomia truncatula* of Jeffreys belong to a very distinct group for which I suggest the name *Jordaniella*."

<sup>17</sup> Mr. E. K. Jordan has given a description of this species in a manuscript dealing with the Pleistocene of Magdalena Bay, Lower California. Mr. Jordan's description is given here to avoid the use of a *nomen nudum* in the list of species from the Pleistocene of Maria Madre Island.

<sup>18</sup> *Nautilus*, vol. 11, no. 8, 1897, p. 85. "deep water off Catalina Is., Cala." —Dall, U. S. Nat. Mus. Bull. 112, 1921, p. 165, pl. 14, figs. 1 and 3.

The name *Purpura trochlea* Gray<sup>19</sup> is earlier than *Pseudoliva kelletii* A. Adams. Mr. E. A. Smith who studied the types of these two species, and of *Buccinum actiops* Reeve, in the British Museum, has placed *Macron kelletii* in the synonymy of *M. trochlea* Gray. According to Smith, the type of *M. trochlea* is intermediate with respect to the grooving, between *M. actiops* and *M. kelletii*. (See Jour. Conch. vol. 10, no. 12, 1903, p. 351).

*Macron orcutti* Dall (Proc. Biol. Soc. Washington, vol. 31, 1918, pp. 5-8. "Magdalena Bay, L. Cal. C. R. Orcutt.") is said to be distinct from *M. actiops*. According to Dall, the species is finely, sharply, and uniformly, spirally striated.

*Calliostoma palmeri* Dall  
Plate 21, figures 1 and 2

*Calliostoma palmeri* Dall, Amer. Jour. Conch., vol. 7, 1872, p. 125, pl. 15, fig. 15. "Guaymas, ten specimens. Dr. E. Palmer." — Strong, Hanna and Hertlein, Proc. Calif. Acad. Sci., ser. 4, vol. 21, no. 10, 1933, pl. 5, figs. 1 and 2. San Felipe at the head of the Gulf of California.

The specimens referred to this species are young and somewhat weathered, but they are similar to Recent specimens of *Calliostoma palmeri* Dall. *C. bonita* Strong, Hanna and Hertlein,<sup>20</sup> has a different number of spiral threads, which are smooth instead of granular, and the Recent shells are more highly colored. The granular spiral threads as well as the low spire and slightly excavated umbilical region distinguish Dall's species from *C. eximium* Reeve<sup>21</sup> and *C. tricolor* Gabb.<sup>22</sup>

Plesiotype No. 6047 (C. A. S. type Coll.) from San Ignacio Lagoon, Lower California. H. Hemphill collector. Pleistocene.

Modulus disculus Philippi.

*Trochus disculus* Philippi, Zeitschr. für Malakozool. April, 1846, p. 51. "Mazatlan." — Philippi in Küster, Conch.-Cab. Bd. 2, Abt. 3, 1846-1851, Taf. 36, fig. 14.

*Modulus disculus* Philippi, Tryon, Manual Conch. vol. 9, 1887, p. 261, pl. 48, figs. 93, 94. "Acapulco, Mazatlan." (Pl. 48, fig. 5 as *M. dorsuosus* Gould). — Stearns, Proc. U. S.

<sup>19</sup> *Purpura trochlea* Gray in Griffith's Cuvier's Animal Kingdom, vol. 12, 1834, pl. 32, fig. 14 [No description or locality].

*Pollia trochlea* Gray, Zool. Beechey's Voyage, 1839, p. 111. [Description given, but no locality].

*Pollia trochlea* Gray, Tryon, Manual Conch. vol. 3, 1881, p. 277. "? = *Purpura trochlea*."

*Macron trochlea* Gray, E. A. Smith, Jour. Conch. vol. 10, no. 12, 1903, p. 351.

<sup>20</sup> Proc. Calif. Acad. Sci., ser. 4, vol. 21, no. 10, 1933, p. 121, pl. 5, figs. 5 and 6 "dredged in Acapulco Bay, Mexico."

<sup>21</sup> *Calliostoma eximium* Reeve. See Pilsbry, Manual Conch. vol. 11, 1889, p. 366, pl. 65, figs. 84, 85, 86. "Mazatlan; Cape St. Lucas; fossil in post tertiary at San Ignacio Lagoon."

<sup>22</sup> *Calliostoma tricolor* Gabb, Proc. Calif. Acad. Nat. Sci. vol. 3, 1865, p. 186. "Hab. San Pedro, five alive on the sand shoal; and Half Moon Bay, beach; also San Diego. Dr. Cooper. Also fossil in the Post Pliocene, San Pedro." — Pilsbry, Manual Conch. vol. 11, 1889, p. 370, pl. 67, fig. 52. "Santa Cruz to San Diego."

Nat. Mus. vol. 17, 1894, p. 192. "Tres Marias." Also Mazatlan, Acapulco, Panama. — Petit de la Saussaye, Jour. de Conchyl. vol. 4, 1853, p. 136. "Mazatlan (Philip.)." — Pilsbry & Lowe, Proc. Acad. Nat. Sci., Philadelphia, vol. 84, 1932, p. 123. "La Paz; Taboga Island."

*Modulus dorsuosus* Gould, Boston Jour. Nat. Hist. vol. 6, 1852, p. 383, pl. 14, fig. 12. "Found at Acapulco."

*Modulus disculus* Philippi occurs in the Pleistocene of San Ignacio Lagoon, Lower California. The high spire and the much less developed radial ribs easily distinguish this species from *M. cerodes* A. Adams<sup>23</sup> which occurs in the Pleistocene of Maria Madre Island and of Magdalena Bay, as well as living in the Gulf of California. *M. disculus* has a known range from Mazatlan, Mexico to Taboga Island, Panama. The species listed as *M. disculus* from Mozambique<sup>24</sup> by Petit de la Saussaye apparently represents another species.

*Neritina usurpatrix* Crosse & Fischer.

*Neritina picta* Sowerby, Proc. Zool. Soc. London, 1835, p. 201. "Hab. ad Panaman." — Sowerby, Conch. Illustr., September 29, 1836, *Neritina*, p. 3, pl. 86, fig. 1. "Panama. — Sowerby, Thes. Conch. vol. 2, 1855, p. 530, pl. 116, figs. 267, 268, 269. Panamà; on a mud-bank, partially overflowed with fresh water. *Cuming.*" — Reeve, Conch. Icon. vol. 9, 1855, *Neritina*, pl. 23, figs. 101a, 101b, [Same record as the preceding reference.] — Troschel, Das Gebiss der Schnecken, vol. 2, 1878, p. 176, pl. 16, fig. 9. [This reference not seen.] — E. Von Martens, in Martini-Chemnitz Conchyl.-Cab. Ed 2, Bd. 2, Abt. 10, 1879, p. 191, pl. 19, figs. 22-25. [Reference not seen.] — Tryon, Manual Conch. Ser. 2, vol. 10, 1888, p. 41, pl. 13, figs. 52-55. "Gulf of California to Panama." — Stearns, Proc. U. S. Nat. Mus. vol. 17, 1894, p. 200. Coast of Lower California, Gulf of California, and south to Panama and beyond. — Von Martens, Biologia Centrali-Americanana, 1900, p. 589, pl. 28, figs. 8, 10, 13. Cites earlier records from Guaymas, Mexico, to Payta Peru.

*Nerita (Neritina) picta* Sowerby, Anton, Verzeich. der Conchyl. 1839, p. 29. [No locality given.] — Recluz, Jour. de Conchyl. vol. 1, 1850, p. 152.

*Vitta picta* Sowerby, Mörch, Catalog. Conchyl. Yoldi, 1852, p. 167. "Panama."

*Neritina (Vitta) picta* Sowerby, Mörch, Malakozool. Blätter, Bd. 7, 1861, p. 170.

<sup>23</sup> See Tryon, Manual Conch. vol. 9, 1887, p. 261, pl. 49, figs. 96 and 97.

<sup>24</sup> Petit de la Saussaye, Jour. de Conchyl. vol. 4, 1853, p. 135. "le détroit de Mosambique." A list of species of *Modulus* was given by Saussaye.

*Neritella picta* Sowerby, Binney, Land and Fresh Water Shells of North America, Pt. 3, 1865, p. 105, fig. 211. (Smithsonian Misc. Coll. No. 144.) Cited from Mazatlan as well as farther south.

*Neritina usurpatrix* Crosse & Fischer, Jour. de Conchyl. vol. 40, no. 3, 1892, p. 293. A new name for *Neritina picta* Sowerby, not *Neritina picta* Féruccac (G. P. Deshayes in A. E. Féruccac, Hist. Gener. et Part. Moll. Livr. 20, 1823. [On wrapper of Livr. 20, according to Sherborn, Index Anim.], figs. 4-7). — Crosse & Fischer, Miss. Sci. au Mexique, et dans L'Amérique Centrale, Pt. 7, Moll. vol. 2, 1900, p. 486, pl. 58, figs. 7, 7a, 7b, 7c, 7d. Mazatlan, Mexico to Guayaquil, Ecuador. [Guayaquil record by Wolfe].

*Nerita picta* Sowerby, Pilsbry & Lowe, Proc. Acad. Nat. Sci. Philadelphia, vol. 84, 1932, p. 127. "Mazatlan; La Paz; Guaymas: Gulf of Fonseca: Puntarenas; Salina Cruz."

Specimens referred to this species are present in the Hempill collection from the Pleistocene of San Ignacio Lagoon, Lower California. The shells retain traces of the striped and zig-zag color markings, which are so noticeable on the living specimens. The species has been reported from the Gulf of California to Guayaquil, Ecuador.

Crosse & Fischer pointed out that Féruccac had used the name *Neritina picta* and therefore they renamed Sowerby's species *Neritina usurpatrix*.

#### *Vitrean indentata* Say.

*Helix indentata* Say, Jour. Acad. Nat. Sci. Philadelphia, vol. 2, 1822, p. 372. — Binney, Terrestrial Air-Breathing Mollusks of the United States, vol. 2, 1851, p. 242, pl. 29, fig. 2. "Inhabits the northern, north-eastern, middle, and western states, and is probably a wide-spread species."

*Vitrean indentata* Say, Dall, Proc. Calif. Acad. Sci. Ser. 4, vol. 15, no. 15, 1926, p. 483. Maria Madre and Maria Magdalena Islands. Recent. Also Recent from Canada to Texas and southward to the Federal district of Mexico.

*R[ctinella] (Glyphyalinia) indentata indentata* (Say), H.B.Baker, Proc. Acad. Nat. Sci. Philadelphia, vol. 82, 1930, p. 209. "Type locality: Harrigate and New Jersey," and eastern states.

This interesting species is present in the Pleistocene collection from Maria Madre Island. It also occurs Recent on this Island where it has been recorded by Dall. The species is quite widely distributed in North America, where it has been reported from the eastern and middle western states and from Canada to the Federal district of Mexico.

## PLATE 21

Fig. 1. *Calliostoma palmeri* Dall; plesiotype No. 6047 (C. A. S. type coll.), from San Ignacio Lagoon, Lower California; Henry Hemphill collector; Pleistocene.

Fig. 2. *Calliostoma palmeri* Dall. Basal view of specimen shown in figure 1.

Fig. 3. *Odostomia gallegosi* Hertlein, new species; holotype No. 6059 (C. A. S. type coll.); altitude 4.5 mm., diameter 1.8 mm.; from Loc. 1836 (C. A. S.), along the beach cliffs about the middle of the north shore of Maria Magdalena Island, Tres Marias Group, Mexico. G. D. Hanna and E. K. Jordan collectors; Pleistocene.

Fig. 4. *Eunaticina heimi* E. K. Jordan, new species; holotype No. 5557 (C. A. S. type coll.). Altitude 9.6 mm.; width of body whorl 7 mm.; from Loc. 754 (C. A. S.) Magdalena Bay, Lower California; G. D. Hanna and E. K. Jordan collectors; Pleistocene. This species is present at Loc. 1834 (C. A. S.), Maria Madre Island, Mexico; Pleistocene.

Fig. 5. *Ostrea palmula* Carpenter; upper valve, plesiotype No. 6060 (C. A. S. type coll.) from San Ignacio Lagoon, Lower California. Henry Hemphill collector; Pleistocene. The specimens from this locality possess some characters in common with *O. angelica* Rochebrune, and might perhaps, be considered as falling within the variants of that species.

Fig. 6. *Glycymeris multistriata* Sowerby; plesiotype No. 6066 (C. A. S. type coll.) from Loc. 1834 (C. A. S.) about 215 meters inland at the Salt Works, on the east side of Maria Madre Island, Tres Marias Group, Mexico; G. D. Hanna and E. K. Jordan collectors; Pleistocene.

Fig. 7. *Ostrea palmula* Carpenter; lower valve; plesiotype No. 6061 (C. A. S. type coll.) from San Ignacio Lagoon, Lower California; Henry Hemphill collector; Pleistocene.

Fig. 8. *Ostrea palmula* Carpenter; view of the interior of the specimen illustrated in Figure 5.

Fig. 9. *Plicatula spondylopsis* Rochebrune; plesiotype No. 6068 (C. A. S. type coll.), from same locality as specimen shown in figure 3. This is an enlarged view of the interior of the specimen shown in figure 12.

Fig. 10. *Ostrea palmula* Carpenter; lower valve; plesiotype No. 6061-A (C. A. S. type coll.), from same locality as specimen illustrated in figure 5.

Fig. 11. *Chama squamuligera* Pilsbry & Lowe; plesiotype No. 6067 (C. A. S. type coll.), from same locality as specimen shown in figure 3.

Fig. 12. *Plicatula spondylopsis* Rochebrune; plesiotype No. 6068 (C. A. S. type coll.), altitude of figured specimen 12.5 mm., width 13.1 mm.; from the same locality as the specimen shown in figure 3.

Fig. 13. *Turritella marmorata* Kiener; plesiotype No. 5924 (C. A. S. type coll.), from San Ignacio Lagoon, Lower California; Henry Hemphill collector; Pleistocene. Specimen imperfect due to weathering.

Fig. 14. *Cardium obovale* Sowerby; plesiotype No. 6069 (C. A. S. type coll.), from same locality as specimen shown in figure 3.

All illustrations are approximately natural size except where dimensions are given. Photographs of the specimens were made by G. D. Hanna, A. Christofferson and W. M. Grant.

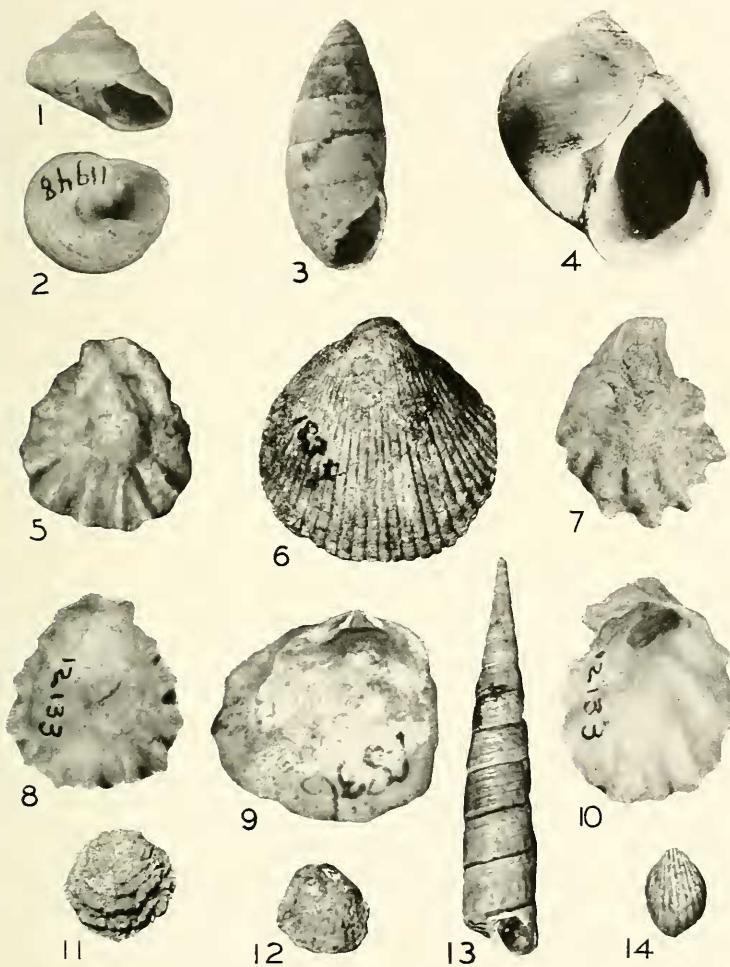


PLATE 21